

## Vision Based Object Detection and Navigation for Spacecraft

Completed Technology Project (2015 - 2019)



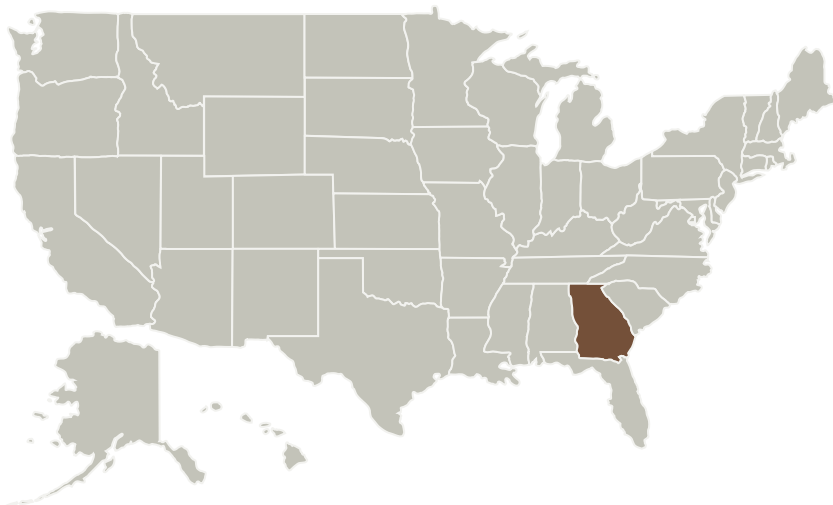
## Project Introduction

An autonomous relative navigation system based on a combination of low cost infrared and vision sensors will be created. Such a system has the potential to be relatively small size, low cost, and capable of autonomous operation over a wide range from a few meters up to several kilometers, even on uncooperative objects such as dead satellites and space debris. This proposal uses recently developed COTS sensor hardware and robust algorithms to perform measurement modeling and simulation, relative navigation, object identification and state estimation that I will develop and code in software. I will combine new methods of image processing, object identification, tracking, and state estimation into an overall system that is robust to varied optical (lighting, focus) and range conditions. The system performance will be tested using high-fidelity simulated images. These software tools will then become part of the NASA AR&D Warehouse, and can be used for a wide range of proximity operations applications in future spacecraft missions.

## Anticipated Benefits

An autonomous relative navigation system based on a combination of low cost infrared and vision sensors has the potential to be relatively small size, low cost, and capable of autonomous operation over a wide range from a few meters up to several kilometers, even on uncooperative objects such as dead satellites and space debris.

## Primary U.S. Work Locations and Key Partners

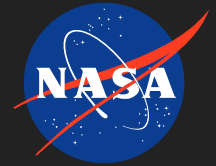


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## Vision Based Object Detection and Navigation for Spacecraft



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Organizations Performing Work	Role	Type	Location
Georgia Institute of Technology-Main Campus(GA Tech)	Lead Organization	Academia	Atlanta, Georgia

## Primary U.S. Work Locations

Georgia

## Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Georgia Institute of Technology-Main Campus (GA Tech)

**Responsible Program:**

Space Technology Research Grants

## Project Management

**Program Director:**

Claudia M Meyer

**Program Manager:**

Hung D Nguyen

**Principal Investigator:**

Glenn Lightsey

**Co-Investigator:**

Christopher R McBryde

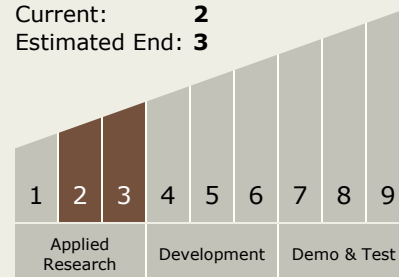
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## Technology Maturity (TRL)

Start: **2**  
Current: **2**  
Estimated End: **3**



## Technology Areas

### Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  - └ TX17.2 Navigation Technologies
    - └ TX17.2.5 Rendezvous, Proximity Operations, and Capture Sensor Processing and Processors

## Target Destinations

Earth, The Moon, Others Inside the Solar System